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Insect Control for South Dakota Small Grain, 1997

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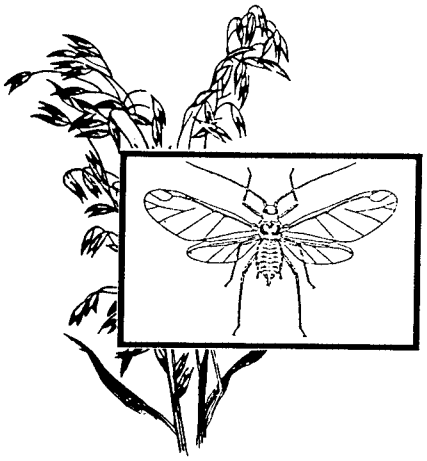

INSECT CONTROL for South Dakota SMALL GRAIN, 1997

by Murdick McLeod, Extension entomologist, SDSU Plant Science Department

Sound insect management involves a complete program of cultural, mechanical, biological, and chemical control tactics. Several pest management tactics should be carefully planned and implemented before considering an insecticide application.

Such tactics may include crop rotations to eliminate or reduce the severity of pest infestation, crop varieties resistant or tolerant of pest damage, or biological control. These cultural management strategies are emphasized in this publication because many wheat infesting insects have no effective chemical controls.

Biological control, in the classic sense, occurs when an exotic natural enemy is released, establishes itself, and maintains economic control of the pest from year to year. Augmentation is another approach to biological control; it involves releasing additional natural enemies when there are not enough of them in their natural population to control the pest.

Although there are limited examples of classical biological control successes in **field** crops, perhaps the best approach to biological control in these situations is to conserve natural enemies by using insecticide applications **only** when absolutely necessary to prevent unacceptable economic loss.

A thorough understanding of pest biology is also imperative to effective pest management. This understanding should include knowledge of the life cycle, damaging stages, effective scouting procedures, stages vulnerable to control, and proper timing of control. This will result in wise and judicious use of insecticidal inputs.

Although chemical control should be a last resort and should be used **only** when an economic threshold has been reached, chemical controls continue to be an integral part of many pest management programs. For more specific information on pest biology, scouting, and management, contact your local county Extension agent.

GENERAL GUIDELINES

This publication is intended for use by county Extension agents, pesticide dealers, consultants, commercial applicators, and producers. Recommendations are current at the time of printing.

Tradenames have been used in some instances, but their use does not imply endorsement of any product over another or discrimination against a similar product. The most commonly available formulations have been included in the tables. If using other formulations than those specified in the tables **consult the label** for application rates. Follow all label precautions when using any pesticide.

Most insecticides are capable of causing injury to applicators if not handled properly. Always wear protective equipment as specified on the pesticide label. Avoid contact with skin, mouth, nose, eyes, and clothing. Bathe and wash clothing after exposure to any insecticides. Wash clothing on which insecticide residues may have accumulated before wearing again. Wash insecticide contaminated clothing separate from other household laundry.

Abbreviations Used

fl oz = fluid ounces	pt = pint	E, EC = emulsifiable concentrate
lb = pound	qt = quart	F = flowable
oz = ounces		G = granular

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Cereal Aphids

Three species of cereal aphids commonly are found in small grains grown in South Dakota: greenbug, English grain aphid, and bird cherry-oat aphid. Corn leaf aphids and Russian wheat aphids are occasionally encountered, but much less frequently.

Greenbugs

This is still the most damaging species, especially when it attacks seedling-stage winter wheat in the western areas of the state. Greenbugs feed by inserting piercing-sucking mouthparts into plant tissue and removing plant sap. When they feed, they inject a toxin into the plant which results in further damage.

Greenbugs can be recognized by a dark green stripe down the middle of a pale greenish-yellow back. Greenbugs have black tips on their cornicles "tailpipes" and antennae. Plants infested with greenbugs first turn yellow, resulting in a localized circular area of yellow plants in the field. As plants die from feeding damage, greenbugs move to uninfested plants, enlarging the affected area.

Greenbugs, like the other cereal aphids we encounter, do not overwinter in South Dakota but move into our area in strong southerly wind currents or weather fronts. Greenbugs give birth to living young, and all offspring are female, thus the potential for population increase is tremendous. Optimum temperature for greenbug development is approximately 75 F. At temperatures around 55 F, natural enemies of greenbugs reproduce very slowly, which may result in a buildup of greenbugs.

Bird Cherry-oat Aphids

These insects are olive-green with a reddish-orange spot on the back near the base of the cornicles. Tips of leg segments, tips of cornicles, and the antennae are black. This aphid is now thought to be more damaging than previously expected, and economic infestations can occur, especially on seedling winter wheat. This species is also the primary vector of barley yellow dwarf, a serious virus disease of small grain.

English Grain Aphids

These aphids are bright green with black legs, cornicles, and antennae. Although often observed in small grain in South Dakota, this species does not frequently reach damaging populations. However, after grain begins to head, this aphid will be found clustered in the heads, causing alarm to some growers.

Table 1. Insecticides for aphid control in small grain.

Insecticide	Formulation	Product per Acre	Remarks, precautions
chlorpyrifos (Lorsban)	4 E-SG	½ - 1 pt	Do not harvest grain for 28 days. Do not graze or feed forage for 14 days.
dimethoate (Cygon 400, Dimethoate 400)	4 E	½ - ¾ pt	Wheat only. Days to harvest varies with manufacturer, read the label.
disulfoton (Di-Syston)	8 E	4 - 12 fl oz (wheat) ½ - 1 pt (barley)	Foliar application. Do not harvest for 30 days. Do not graze or cut for forage after any application of this product.
	15 G	6.7 lb	Barley and wheat. Do not harvest barley for 60 days. Do not graze or cut barley forage for 30 days. Do not graze or cut wheat forage for 75 days. Apply by drilling or broadcast at planting.
malathion	5 E	1½ - 2 pt	Barley, oats, rye, and wheat. Do not harvest for 7 days.
parathion (ethyl parathion)	8 E	¼ pt	Wheat and barley. Do not harvest for 15 days. Reentry interval 3 days. Fields must be posted.
(methyl parathion)	4 E	½ - 1½ pt	Wheat, oats, barley and rye. Do not harvest for 15 days. Reentry interval 2 days.
(Penncap-M)	2 FM	2-3 pt	Wheat, oats and barley. Do not harvest for 15 days. Reentry interval 2 days.
phorate (Thimet)	5 G 20 G	1.6 oz/1000 foot of row 1.2 oz/1000 foot of row	Wheat. Do not harvest, graze, or feed forage for 70 days. Apply granules in seed furrow.
carbofuran (Furadan)	4 F	0.25 - 0.5 fl oz per 1000 foot of row	Wheat, barley, oats. Apply in-furrow using microtube injection system. Do not feed treated forage to livestock.

Populations of all cereal aphids are reduced by several natural enemies, including lady beetles, green lacewing larvae, syrphid fly larvae, and tiny parasitic wasps. The most abundant natural enemies of aphids in South Dakota are probably the several species of lady beetles.

If natural enemies are abundant and the crop is in later stages of development, chemical controls should be avoided to prevent damage to the natural enemy populations.

Aphid Thresholds

Recent research at midwestern universities has indicated that previously used thresholds for cereal aphids have probably been too high. It is now suggested that small grain fields be treated for greenbugs, bird cherry-oat, and English grain aphids with one of the insecticides in Table 1 if an average of 12-15 aphids is present per tiller during the seedling to boot stage.

Treating small grains for the above three aphids after the grain has headed is still not recommended.

Russian Wheat Aphids

This aphid may be distinguished from other aphids on small grain by the absence of prominent cornicles. This is the single most distinguishing character, although additional characters include a prominent projection above the tail which gives it a double tail appearance, short antennae, and an elongated, spindle-shaped body.

Damage symptoms include longitudinal leaf streaking in contrast to the necrotic "spots" of other cereal aphids. These longitudinal stripes are often purple, yellow, or white. Damaged leaves are often curled with the aphids found within the curled leaves.

This aphid is capable of causing very significant yield losses. Russian wheat aphids have been recorded from several southwestern South Dakota counties and required treatment one year, but they have not been a consistent problem for South Dakota producers.

In the event of an infestation, suggested treatment thresholds are 15-20% of tillers infested up to flowering, and 20+% of tillers infested from flowering to early milk. If chemical control is necessary, Lorsban 4E, Di-Syston 8E, or dimethoate are products of choice.

Grasshoppers

Grasshoppers are a potential threat to small grain crops in any given year. Given the proper environmental conditions, spring seeded small grain can be damaged by grasshoppers, and certainly late-season grasshopper populations can present a significant threat to winter wheat seedlings as the grasshoppers migrate to field edges from ditch banks, rangeland, and other marginal hatching beds. Large grasshoppers can be monitored visually, and immature (nymphal) populations can be checked by sweep net.

For specific information on monitoring grasshoppers, obtain Factsheet #859, "Grasshopper Control: Economic Thresholds," available in all county Extension offices.

Suggested treatment thresholds are 8 or more grasshoppers per square yard in the field or 20 or more per square yard in the field margins. Insecticides labeled for grasshopper control in small grains are listed in Table 2.

Wheat Stem Sawflies

Wheat stem sawflies overwinter in their last larval stage in wheat stubble just below the soil surface. Larvae pupate in the spring and emerge as adults in early June.

Wheat in the stem elongation to boot stage is favored for egg laying by these 1/2-inch-long, slender wasps. Sawfly adults will deposit a single egg per stem and have a characteristic habit of resting on plants with their heads downward on plant stems. Eggs hatch and larvae burrow within the stem of affected plants. As the crop matures, larvae burrow downward toward the soil and cut a small notch in the stem which they will use for emergence the following spring.

Wheat stem sawflies damage the crop in three ways. Tunneling activity will reduce grain yield by 10-14%, harvest loss occurs when cut stems fall to the ground before harvest, and protein content of grain from infested stems is reduced.

Management options for wheat stem sawfly include resistant varieties, rotation with non-susceptible crops, delayed planting with susceptible varieties, and shallow fall tillage.

Sawfly damage is most prevalent in fields continuously cropped to hard red spring wheat and where stubble is left undisturbed. Rotation to a non-host crop should be strongly considered as an option for wheat stem sawfly. Sawflies do not damage oats, flax, sunflower, safflower, and legumes. Winter wheat, durum wheat, barley, and rye will allow some larvae to survive but are not affected as severely as hard red spring wheat.

Several solid-stemmed varieties have been developed which are resistant to wheat stem sawfly. They include Cutless, Glenman, Leader, Lew, Tioga, and Fortuna. These varieties are resistant to cutting by sawfly larvae, but this advantage is offset by the fact that most have considerably lower yield potential and increased lodging rate than standard hollow-stemmed varieties.

Planting of solid-stemmed varieties will probably not result in an economic advantage unless sawfly pressure is consistently very heavy. In areas which frequently experience sawfly damage, planting a resistant variety just around the edge of the field may offer some advantage.

Delayed planting will result in wheat which is not susceptible or favorable for egg laying by sawfly adults. However, yield reductions due to late planting will likely offset any advantage gained from sawfly control. If planting is delayed beyond May 15 because of bad weather, a susceptible variety can safely be planted.

Research has demonstrated that a shallow fall tillage will result in approximately 90% mortality of overwintering larvae. A similar tillage operation in the spring will result in only about 30% mortality.

Sawfly damage is most severe, and may even be limited to, field edges. Therefore, in areas where conservation of soil and crop residue is important, consider a shallow fall tillage just around the edge of the field.

In addition to the above management practices, harvest losses may be reduced by harvesting the edges of the most severely infested fields first, or by swathing the edges of severely infested fields before lodging occurs in these areas.

Chemical control of wheat stem sawfly has not been consistent and is not a viable option at this time.

Wheat Stem Maggot

Larvae of this insect overwinter in the stems of grasses and volunteer grain. Adults are small yellowish flies with three dark stripes on the thorax. They deposit eggs on leaves or stems of grain. When eggs hatch, larvae move down below a leaf sheath and tunnel into the stem. This damage to the stem will cause the head to turn white, the first indication of wheat stem maggot infestation.

Resistant varieties have not been developed for wheat stem maggot, but late maturing varieties suffer less damage than early-maturing varieties.

Rotation to non-susceptible crops such as corn, sunflowers, flax, soybeans, or legumes will reduce numbers of this pest. Wheat, durum, rye, oats, and barley are all attacked by wheat stem maggot, with wheat being preferred. Several wild grasses also serve as hosts for this insect.

Infestation levels usually are quite low but may occasionally be dramatic.

Management options are fairly limited. No chemical control is effective or recommended for this pest.

Hessian Fly

Hessian flies overwinter in their last larval stage in a puparium referred to as the "flaxseed" stage. Adults emerge from April to May and deposit eggs in the grooves on the upper sides of wheat leaves. Larvae move beneath leaf sheaths of the lower leaves of the plant where they withdraw sap from the lower part of the stem for 7 to 14 days. Injury is not caused by physical damage to the plant but from a toxic salivary secretion which interferes with metabolism and growth.

Damage by Hessian fly occurs predominantly in spring wheat in South Dakota, but some damage may occur to winter wheat in areas where both are grown. Damage symptoms on hard red spring wheat include plants with a dark bluish-green color and thickened, stunted shoots. The central growing shoot may be absent. When heads begin to fill, infested stems will break. Stunted tillers may wilt and die; if they do survive, growth and yield will be significantly reduced.

Management options include resistant varieties, crop rotation, destroying volunteer wheat, and planting-time insecticide applications.

Table 2. Insecticides for grasshopper control in small grain.

Insecticide	Formulation	Product per Acre	Remarks, precautions
carbaryl (Sevin)	XLR	1 - 3 pt	Wheat. Do not harvest grain for 21days. No limitation for forage.
carbofuran (Furadan 4F)	4 F 4F	¼ - ½ pt 0.25 - 0.5 fl oz/1000 foot of row	Wheat, oats, barley. Apply before heads emerge from boot. Apply in-furrow using microtube injection system. Do not feed treated forage to livestock.
chlorpyrifos (Lorsban)	4 E-SG	½ - 1 pt	Do not harvest grain for 28 days. Do not graze or feed forage for 14 days.
dimethoate (Cygon 400, Dimethoate 400)	4 E	¾ pt	Wheat only. Days to harvest varies with manufacturer, read the label.
disulfoton (Di-Syston)	15 G	6.7 lb	Winter wheat. Apply by drilling orbroadcast in fall. Do not graze or cut forage for 75 days.
lambda cyhalothrin (Warrior)	1 EC	2.56 - 3.84 oz	Wheat and triticale. Do not harvest for 30 days.
malathion	5 E	1½ - 2 pt	Barley, oats, rye, and wheat. Do not harvest for 7 days.
parathion (ethyl parathion)	8 E	½ pt	Wheat and barley. Do not harvest for 15 days. Reentry interval 3 days. Fields must be posted.
(methyl parathion)	4 E	¾ - 1 pt	Barley, oats, rye and wheat. Do not harvest for 15 days. Reentry interval 2 days. Wheat, barley, and oats. Do not harvest or graze for 15 days.
(Penncap-M)	2 FM	2 - 3 pt	Reentry interval 2 days. Use higher rate if majority of hoppers are large or weather is cool. Fields must be posted.
phorate (Thimet)	15 G 20 G	1.6 oz/1000 feet of row 1.2 oz/1000 feet of row	Winter wheat only. Do not harvest,graze or feed foliage for 70 days. Apply granules in seed furrow.

In areas where Hessian flies are a problem, planting a resistant variety is recommended. Guard is a resistant spring wheat variety developed at SDSU which has good yield potential. Crop rotation is another effective management strategy. Rotate to a non-host crop such as oats, corn, sunflowers, flax, soybeans, or legumes. Destroying or eliminating volunteer wheat after harvest will help reduce populations of Hessian fly.

Although at least three species of parasitic wasps are known to attack Hessian fly in South Dakota, these parasites cannot be relied upon to control the pest. Planting date has little impact on Hessian fly populations in spring wheat, whereas planting date is an effective control in winter wheat.

Planting-time insecticides are labeled for Hessian fly control. Thimet 20 G (phorate) is labeled for application to both spring and winter wheat at 1.2 oz of product per 1,000 feet of row for any row spacing. Di-Syston 15G is labeled for application to winter wheat only at a rate of 1.7 oz of product per 1,000 feet of row. Thimet-treated grain should not be harvested, grazed, or fed as forage for 70 days after treatment. Di-Syston-treated wheat should not be grazed or cut for forage within 75 days of application. Apply both compounds through a grass seeder attachment or approved granular applicator for grain drills; do **not** mix with the seed in the planter box.

Because Hessian fly populations are spotty and very difficult to predict, the economic benefits of these insecticide applications are very difficult to assess.

Table 3. Insecticides for control of armyworm in small grain.

Insecticide	Formulation	Product per Acre	Remarks, precautions
carbaryl (Sevin)	XLR	1 - 1½ qt	Wheat only. Do not harvest grainfor 21 days. No limitation on forage. Apply when armyworms are feeding on upper foliage and night temperatures not expected to drop below 55° F.
lambda cyhalothrin (Warrior)	1 EC	2.56 - 3.84 oz	Wheat and triticale. Do not harvest for 30 days.
malathion	5 E	2 pt	Barley, oats, rye and wheat. Do not harvest for 7 days.
methomyl (Lannate)	1.8 L 2.4 LV	1 - 2 pt ¾ - 1½ pt	Barley, oats, rye and wheat. Do not harvest grain for 7 days. Do not graze for 10 days. Reentry interval 1 day.
parathion (ethyl parathion)	8 E	¼ pt	Wheat and barley. Do not harvest for 15 days. Reentry interval 3 days. Fields must be posted.
(methyl parathion)	4 E	2½ pt	Barley, oats, rye and wheat. Do not harvest for 15 days. Reentry interval 2 days. Fields must be posted.
(Penncap - M)	2 FM	2 - 3 pt	Barley, oats, wheat. Do not harvest or graze for 15 days. Reentry interval 2 days. Fields must be posted.

Army Cutworm and Pale Western Cutworm

These two cutworms are frequently present at some level in western South Dakota small grains.

Pale Western Cutworms

This cutworm overwinters as eggs which hatch in early spring. Larvae are grayish-white with no distinct stripes or body markings. As they mature and become larger, pale western larvae will be greenish-white. Pale western cutworms are primarily subterranean, feeding below the soil surface.

Army Cutworms

These cutworms overwinter as larvae and feed more on the soil surface. Larvae are a grayish color but can be distinguished from pale western cutworms by distinct longitudinal stripping on the body. Army cutworms are generally active at lower temperatures and earlier in the season than pale westerns. Feeding is not as damaging because leaf feeding is more prevalent than stem cutting.

Winter wheat fields should be monitored for presence of cutworms beginning very early in the season. Army cutworms may be active at temperatures as low as 40 F. Examine several areas of the field for plants which have leaf feeding damage or, in the case of pale westerns, wilted, cut plants. Scratch the soil surface to a depth of 2 to 4 inches in square-foot areas of the row in search of larvae. Sample several areas of the field and record the average number of pale western and army cutworms per square foot.

Treatment thresholds for army cutworms are 2 per square foot in wheat 4 inches or less in height, and 4 per square foot in wheat 6 inches or taller. Pale western cutworms should be treated if 1 or more larvae are present per linear foot of row.

Economic damage also will depend on environmental conditions in the field. If plants are slow in coming out of dormancy and are under moisture stress, these thresholds may be lower. If wheat is growing vigorously and soil moisture is high, economic damage may not occur at the suggested thresholds.

Lorsban 4E-SG applied at the rate of 1 pint per acre will control army cutworm and provide suppression of other cutworms. A second application of 1 pint per acre may be made for additional control.

Warrior 1 EC is a new pyrethroid insecticide labeled for control of cutworms and army cutworms at the rate of 1.92 - 2.56 fl oz per acre.

True Armyworms

Most armyworm infestations originate from adult flights into South Dakota from southern areas. These migrating adults deposit eggs in areas of lush vegetation, especially in tall grain or grass that has been lodged by wind or hail, or in fields with infestations of foxtail.

Larvae emerging from these eggs feed on leaf tissue and may significantly damage small grains. Larvae vary from green to black, with stripes of various colors.

Early instar armyworms may be detected before defoliation occurs by using a sweep net in small grain. If larvae are present, sample several areas in the field, particularly areas with lodging or heavy grass pressure.

Treat armyworms with an insecticide listed in Table 3 when 5 worms occur per square foot. Armyworms feed mostly at night, so make applications in early morning or evening for best results.

Wheat Curl Mite

This tiny, whitish mite carries and transmits the virus that causes wheat streak mosaic, a serious viral disease in small grain. The mite feeds on the upper surface of leaves, preventing the leaves from unrolling normally.

Chemical controls have not proven effective.

Management strategies include destruction of volunteers and later planting dates.

If possible avoid planting next to alternate crops such as corn, sorghum, or other grass crops because these will serve as a reservoir for infestation.

Tradenames are mentioned for reader convenience only and do not imply endorsement of products or services.

COOPERATIVE EXTENSION SERVICE SDSU

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